NBSE Class 11 Maths Syllabus

MATHEMATICS

Objectives

The broad objectives of teaching Mathematics at Higher Secondary School stage intend to help the pupil to:

- acquire knowledge and critical understanding, particularly by way of motivation and visualization of basic concepts, terms, principles, symbols and mastery of underlying processes and skills;
- feel the flow of reasons while proving a result or solving a problem;
- apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method;
- develop positive attitude to think, analyze and articulate logically;
- develop interest in the subject by participating in related competitions;
- acquaint students with different aspects of Mathematics used in daily life;
- develop an interest in students to study Mathematics as a discipline;
- develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of sex biases;
- develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

DESIGN OF QUESTION PAPER
MATHEMATICS

Weightage to different forms of questions:

Sl. No.	Forms of questions	Marks for each question	No. of questions	Total marks
1.	MCQ	1	10	10
2.	SA- I	2	10	20
3.	SA- II	4	10	40
4.	LA	6	5	30
	Total		**35**	**100**

Weightage level of questions:

Sl. No.	Level	Percentage	Marks
1.	Easy	15	15
2.	Average	70	70
3.	Difficult	15	15
	Total	**100**	**100**

The expected time to be taken under different forms of questions shall be as follows:

Sl. No.	Forms of questions	No. of question	Expected time for each question	Total expected time
1.	Reading Question paper	-	-	5 minutes
2.	MCQ	10	2 minutes	20 minutes
3.	SA- I	10	4 minutes	40 minutes
4.	SA- II	10	6 minutes	60 minutes

5.	LA	5	9 minutes	45 minutes
6.	Revision	-	-	10 minutes
			Total time	**180 minutes**

Scheme of Options:
1. Internal choice shall be provided in:
    (i)   any five questions of SA-II
    (ii) all five question of LA
2. The options for the internal choice shall be set from the same unit with the same difficulty level.
3. The question setter has the liberty to modify the textual questions but set questions within the purview of the syllabus.

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Class XI
Mathematics -Core Structure
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Unit-wise weightage

Time: 3 Hrs   **Marks : 100**

Units	Marks
1. Sets and Functions	26
2. Algebra	37
3. Coordinate Geometry	16
4. Calculus	06
5. Mathematical Reasoning	03
6. Statistics and Probability	12
Total	**100**

Unit 1: Sets and Functions   **26 marks**

  1. Sets   **12 Periods**
Sets and their representation. Empty set. Finite and Infinite sets. Equal sets. Subsets. Subsets of the set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and intersection of sets. Difference of sets. Complement of a set. Properties of Complement sets.

  2. Relations and Functions   **14 Periods**
Ordered pairs, Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Cartesian product of the reals with itself (upto $R \times R \times R$).

Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain, co-domain and range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

  3. Trigonometric Functions   **18 Periods**
Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all x. Signs of trigonometric functions and sketch of their graphs. Expressing sin ($x + y$) and cos ($x + y$) in terms of sin x, sin y, cos x and cos y. Deducing the identities like following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x}$$

$$\sin x + \sin y = 2\sin\frac{x+y}{2}\cos\frac{x-y}{2}, \cos x + \cos y = 2\cos\frac{x+y}{2}\cos\frac{x-y}{2}$$

$$\sin x - \sin y = 2\cos\frac{x+y}{2}\sin\frac{x-y}{2}, \cos x - \cos y = -2\sin\frac{x+y}{2}\sin\frac{x-y}{2}$$

Identities related to sin $2x$, cos $2x$, tan $2x$, sin $3x$, cos $3x$ and tan $3x$. General solution of trigonometric equations of the type sin θ = sin α, cos θ = cos α and tan θ = tan α. Proofs and simple applications of sine and cosine formulae.

Unit II: Algebra   37 marks

1.   Principle of Mathematical Induction   6 Periods

Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

2.   Complex Numbers and Quadratic Equations   10 Periods

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system, Square-root of a complex number.

3.   Linear Inequalities   10 Periods

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables – graphically.

4.   Permutations and Combinations   12 Periods

Fundamental principle of counting. Factorial n. Permutations and combinations: derivation of formulae and their connections, simple applications.

5.   Binomial Theorem   8 Periods

History, statement and proof of the Binomial Theorem for positive integral indices. Pascal's triangle, general and middle term in Binomial expansion, simple applications.

6.   Sequence and Series   10 Periods

Sequence and Series. Arithmetic Progression (A.P.), Arithmetic Mean (A.M.), Geometric Progression (G.P.), general term of a G.P., sum of n terms of a G.P. Arithmetic and geometric series, infinite G.P. and its sum, Geometric Mean (G.M.). Relation between A.M. and G.M. Sum to n terms of the special series: $\sum n, \sum n^2$ and $\sum n^3$

Unit III: Coordinate Geometry   16 marks

1.   Straight Lines   9 Periods

Brief recall of 2-D from earlier classes, shifting of origin. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts form and normal form. General equation of a line. Equation of family of lines passing through the point of intersection of two lines. Distance of a point from a line.

2.   Conic Sections   12 Periods

Sections of a cone: Circles, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

3. Introduction to Three-dimensional Geometry   **8 Periods**
Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

Unit IV: Calculus   **6 marks**
Limits and Derivatives   **18 Periods**
Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. $\lim\limits_{x\to 0}\dfrac{\log_e(1+x)}{x}, \lim\limits_{x\to 0}\dfrac{e^x-1}{x}$. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

Unit V: Mathematical Reasoning   **3 marks**
Mathematical Reasoning   **8 Periods**
Mathematically acceptable statements. Connecting words/phrases – consolidating the understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implied by", "and", "or", "there exists" and their use through variety of examples related to real life and Mathematics. Validating the statements involving the connecting words – difference between contradiction, converse and contrapositive.

Unit VI: Statistics and Probability   **12 marks**

1. Statistics   **10 Periods**
Measure of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

2. Probability   **15 Periods**
Random experiments: outcomes, sample spaces (set representation). Events: Occurrence of events, 'not', 'and' & 'or' events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events.

Prescribed textbook:
Mathematics for Class XI   –   *Academic Publishers, Kohima, Nagaland*
by Dr. S.N. Pandey, Khrietuo Doulo,
Jane Roseline Yimchunger & Teisovi Gerard Meyase.